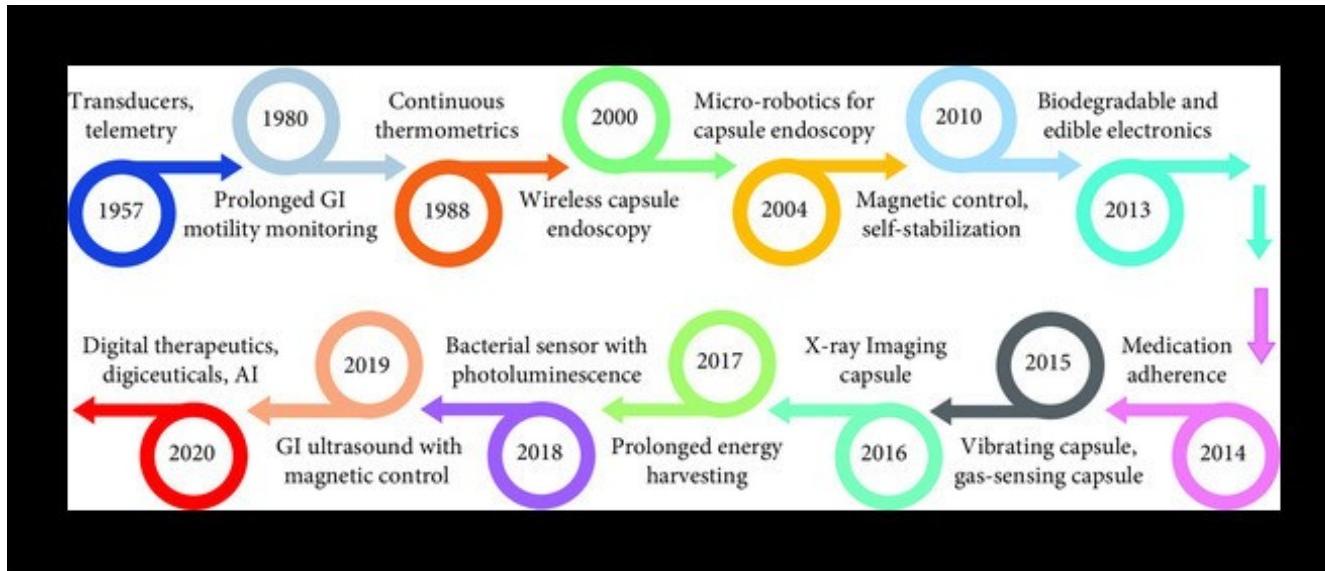




This work surveys the hardware and software technologies for video capsule endoscopy and ingestible electronics. We discuss the sensing parameters, electronics, imaging and reading software, challenges, risks to health, and performance measures.

Paper: **Video Capsule Endoscopy and Ingestible Electronics: Emerging Trends in Sensors, Circuits, Materials, Telemetry, Optics, and Rapid Reading Software, Volume: 2021, DOI: (10.34133/2021/9854040) ; <https://spj.science.org/doi/10.34133/2021/9854040>**



Timeline of ingestible capsule technologies. The evolution of ingestible capsules is illustrated here to show the important discoveries related to prolonged motility monitoring, continuous thermometrics, wireless capsule endoscopy, microrobotics, magnetic control and self-stabilization, biodegradable and edible electronics, medical adherence tracking, vibrating capsules, gas-sensing capsules, X-ray and ultrasound imaging, energy harvesting, bacterial sensing, digital therapeutics, digiceuticals, and artificial intelligence (AI).

REF: Video Capsule Endoscopy and Ingestible Electronics: Emerging Trends in Sensors, Circuits, Materials, Telemetry, Optics, and Rapid Reading Software, Volume: 2021, DOI: (10.34133/2021/9854040)
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Continuous core body temperature monitoring capsules. (a) The BodyCap e-Celsius Core Body Temperature Ingestible Capsule measures the gastrointestinal temperature and transmits the data to an external e-Viewer Performance Monitor. (b) The CorTemp Ingestible Core Body Temperature Sensor transmits information on the internal body temperature to the CorTemp Data Recorder worn externally by the user. The images were reproduced with permission from BodyCap (a) and HQ Inc.

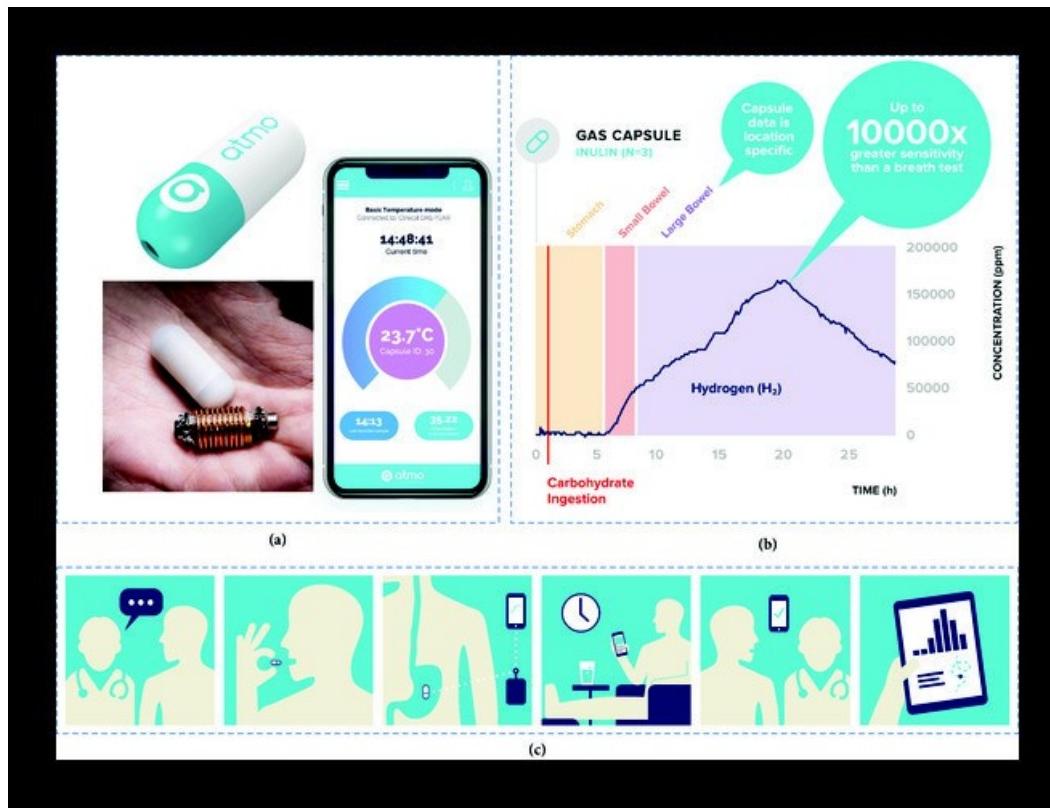
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Video capsule endoscopy and X-ray imaging. (a) The MiroCam capsule endoscope system by IntroMedic is designed to take images of the small bowel mucosa to detect abnormalities. (b) The C-Scan Cap by Check Cap scans the gastrointestinal tract using ultralow-dose X-ray beams. The C-Scan Track consists of three patches worn on user's back for control, monitoring, and recording of the capsule information. The C-Scan View is their cloud-based analysis suite for the 3D reconstruction of the colon and detection of colorectal polyps. The images were reproduced with permission from IntroMedic (a) and Check Cap (b).

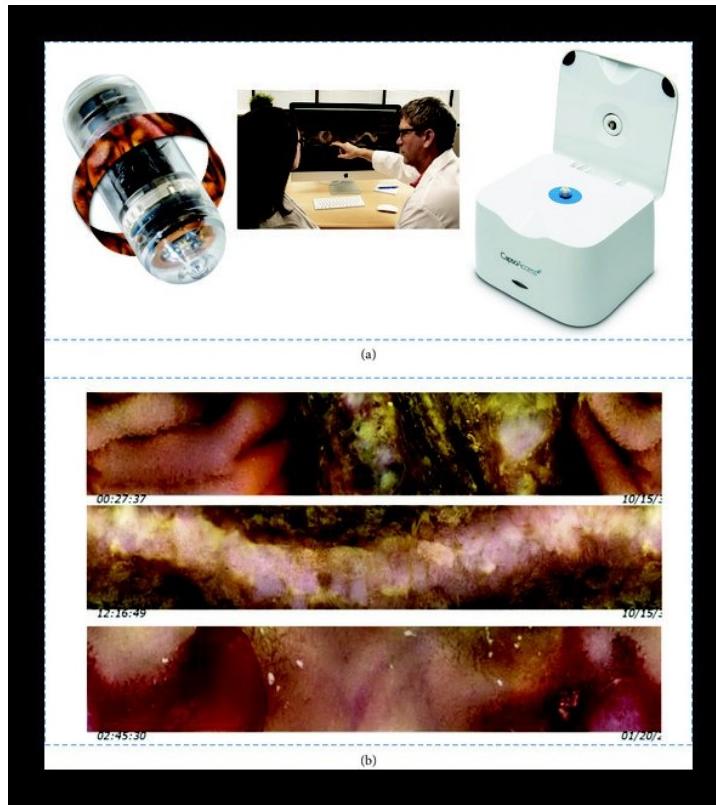
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Gas-sensing capsules by Atmo Biosciences. (a) The Atmo Gas Capsule detects gases in the human gastrointestinal tract at real time for the diagnosis and targeted treatment of gut disorders. (b) The Atmo gas capsule has a higher signal to noise ratio compared to breath tests as the gas concentrations are measured at the site of production. (c) The patient can take the Atmo gas capsule at home, and the data is continuously transmitted to the physician through a smartphone app for analysis. The images were reproduced with permission from Atmo Biosciences.

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Rapid reading software by CapsoVision. (a) The CapsoCam Plus System uses four lateral cameras to capture full 360° panoramic view of the small bowel mucosa. The high-resolution images are reviewed on the CapsoView 3.6 diagnostic interface that has several features, such as multiple viewing modes, playback adjustments, easy archiving, Red Detection system, suggested landmarks, and report generation. (b) Examples of image streams of the small bowel mucosa captured by the CapsoCam Plus and reviewed by the CapsoView 3.6 diagnostic interface. The images were reproduced with permission from CapsoVision.

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